

**Practice Problem - Chapter 5 - Multipole Expansions**

1. A uniformly charged cylinder of radius  $R$ , height  $h$ , and total charge  $Q$  is centered at the origin, with its symmetry axis along the  $\hat{z}$  axis and with  $-h/2 \leq z \leq h/2$ .

a. Obtain the first two non-zero terms in the multi-pole expansion for the electrostatic potential,  $\Phi(r, \theta, \phi)$ .

b. Obtain  $\mathbf{E}(r, \theta, \phi)$  using the result from part (a).